

Research Question

Do synaesthetes have an advantage in visual working memory for numbers, supported by their synaesthetic experience?

Background

Synaesthesia is a phenomenon in which perceived stimuli, for example digits, induce a secondary experience, for example colours (grapheme-colour-synaesthesia) or a spatial arrangement (sequence-space-synaesthesia). Synaesthetic experiences can be internally (Associator) or externally (Projector) perceived. The stimulus that induces the synaesthetic experience is termed “inducer” and the resulted experience is termed “concurrent”. Synaesthetic experiences may lead to an advantage in memory performance and this advantage may be specific for the particular form of synaesthesia (Meier & Rothen, 2013).

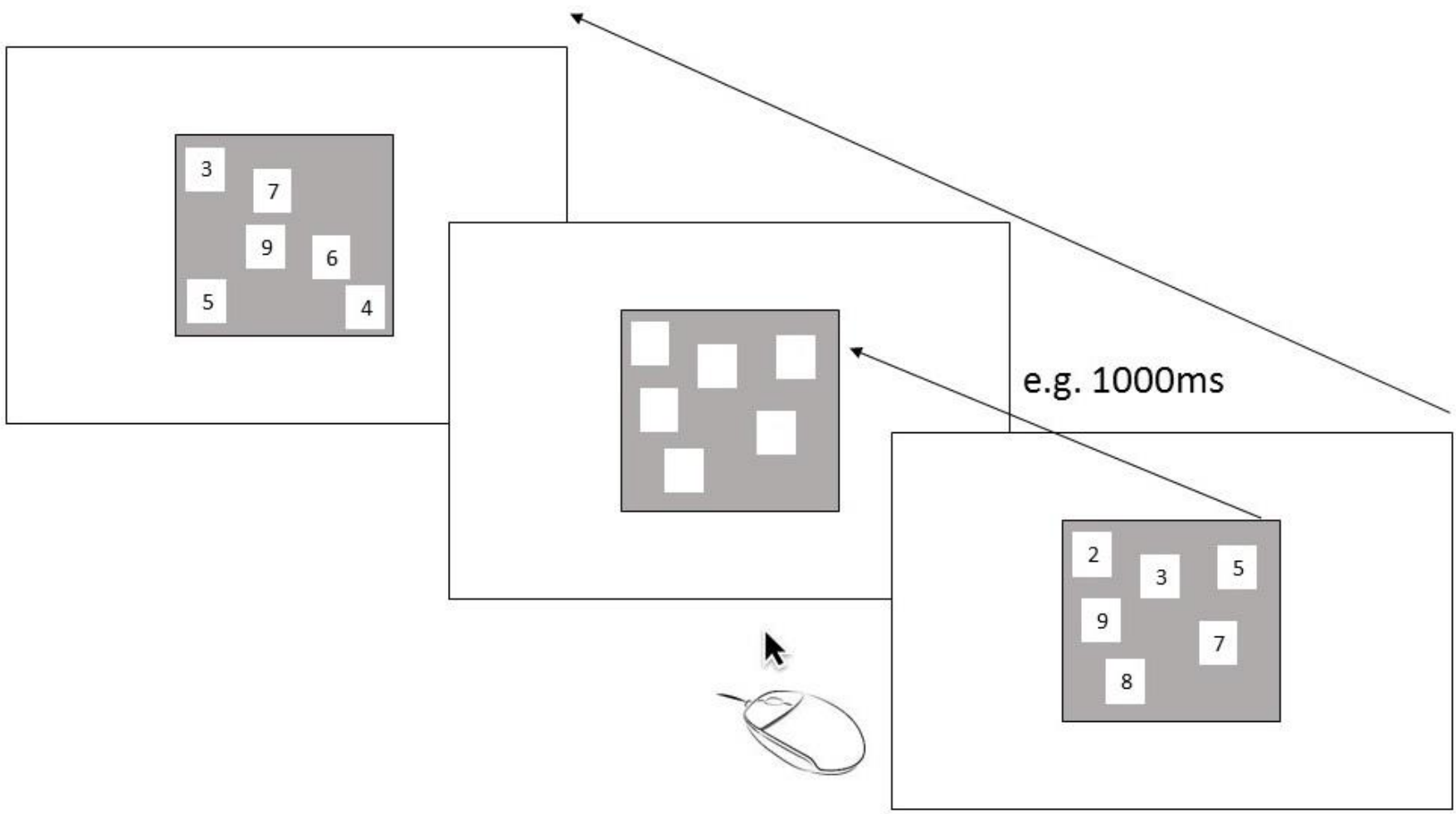
In this study, we used a visual working memory task for digits to test four groups of synaesthetes and matched controls. We hypothesize a domain-specific advantage for grapheme-colour-synaesthetes and sequence-space synaesthetes.

Method

82 synaesthetes and 82 healthy controls matched by age and gender.

Group of synaesthetes	Inducer and concurrent	Hypothesized result
Grapheme-colour N=22	1,2,3/ A,B,C/Word → [red][blue][green] / 1,2,3/ A,B,C/ Word	Advantage
Sound-colour N=17	♪ → [red][blue][green]	No advantage
Grapheme-colour-and-sound-colour N=18	1,2,3/ A,B,C/Word → [red][blue][green] / 1,2,3/ A,B,C/ Word + ♪ → [red][blue][green]	Advantage
Sequence-space N=19	1,2,3/ A,B,C/ days → 1 2 3 4 5 a b c d	Advantage

Working-memory task: Participants had to click in an ascending order into the white squares in which they had seen 5 digits before.

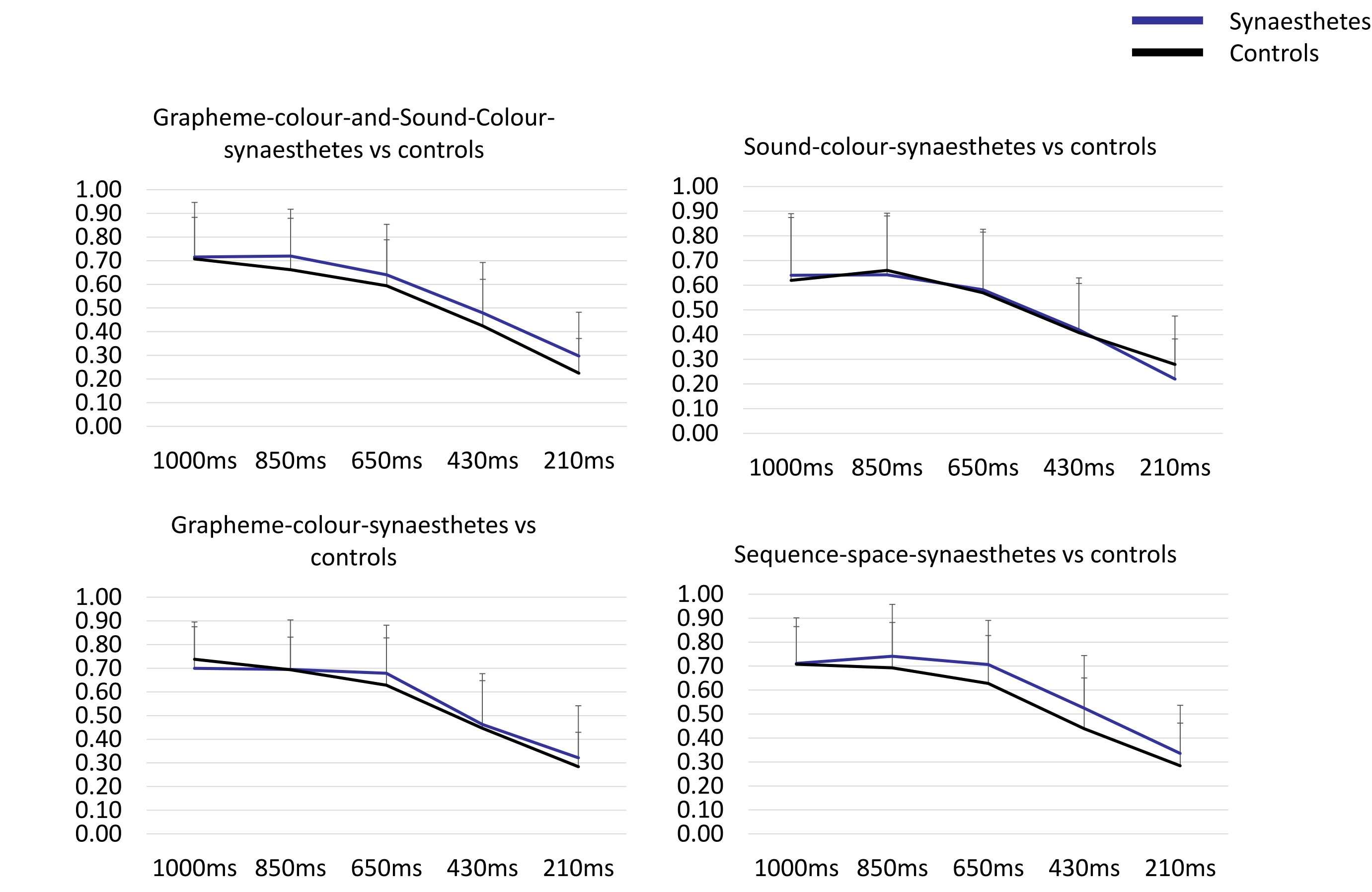


All participants performed the task in the same order, presentation time descending from 1000ms to 850ms, 640ms, 430ms and 210ms over 10 separate blocks with 24 trials each.

ISEQ-questionnaire for the classification of projectors and associators among the grapheme-colour-synaesthetes (Skelton et al., 2011).

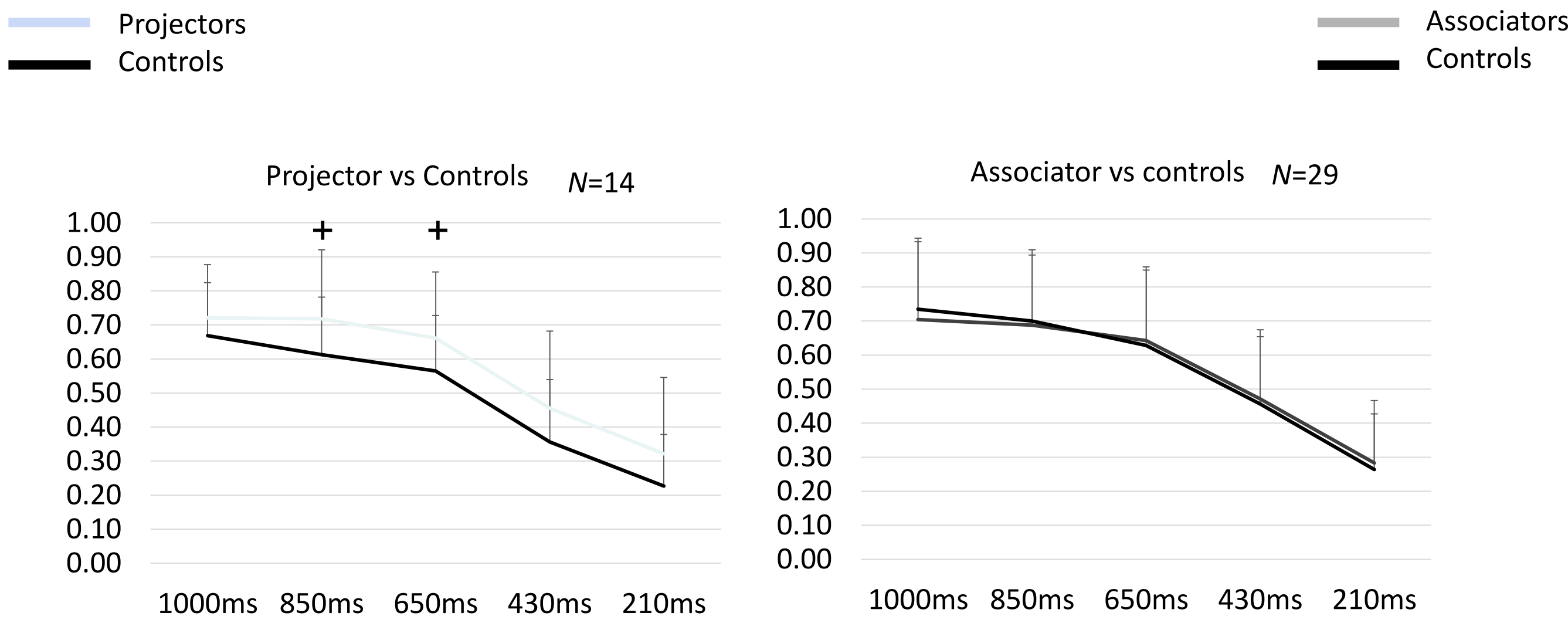
Results

Comparison of mean accuracy of the four groups and their matched controls at the five display presentation times



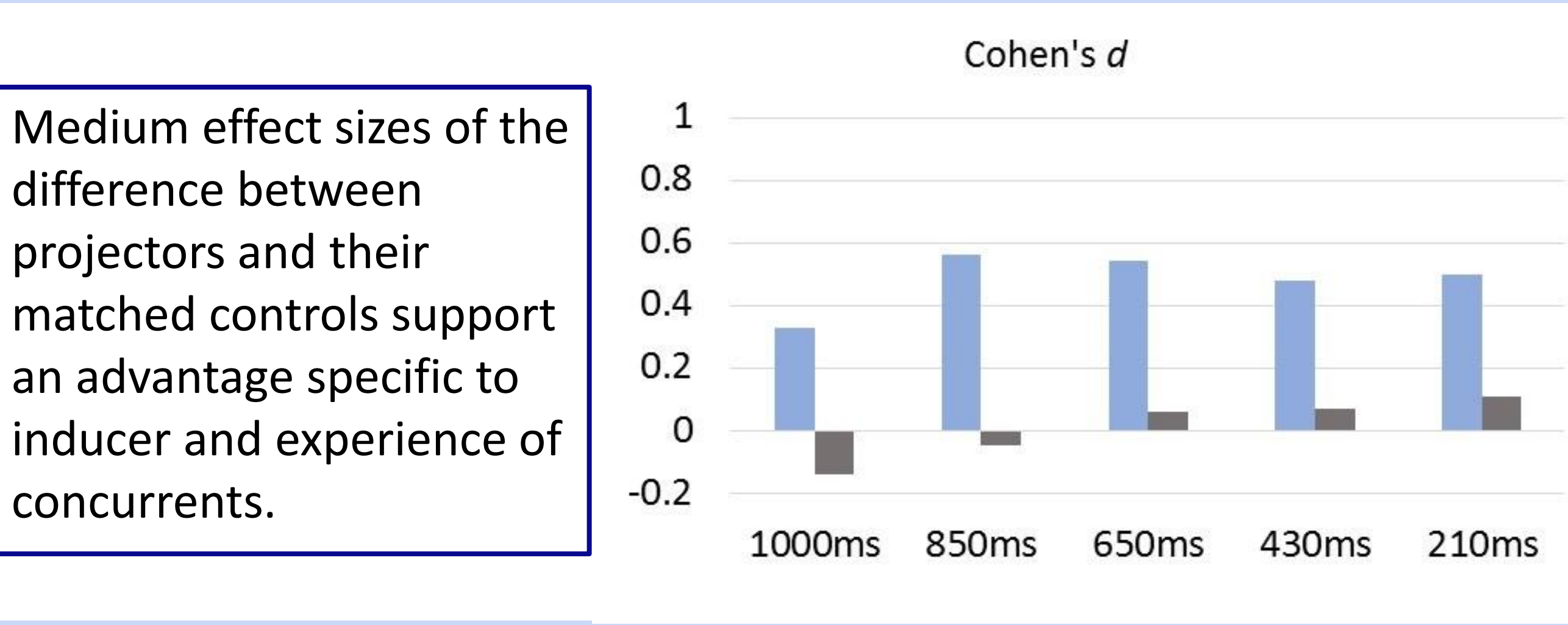
The results show the expected domain-specific advantage. However, no group-difference was significant.

Fine-grained analysis for grapheme-colour-synaesthetes: mean accuracy for projectors, associators and their matched controls



The results show an advantage for projectors but not for associators compared to their matched controls.

Effect sizes of mean differences for projectors and associators compared to their matched controls



Medium effect sizes of the difference between projectors and their matched controls support an advantage specific to inducer and experience of concurrents.

Conclusion

- The advantage of grapheme-colour-synaesthetes supports an inducer specific advantage.
- Sequence-space-synaesthetes seem to benefit from inducer as well as concurrent.
- Superior performance of projectors may be due to coloured afterimages.